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Huang

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(54) **RATCHET COUPLING MEANS FOR A DRIVING TOOL**

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(58) **Field of Classification Search** 81/63.1, 81/58.4, 58.3, 60, 62, 63, 438; 192/43.2, 192/43
See application file for complete search history.

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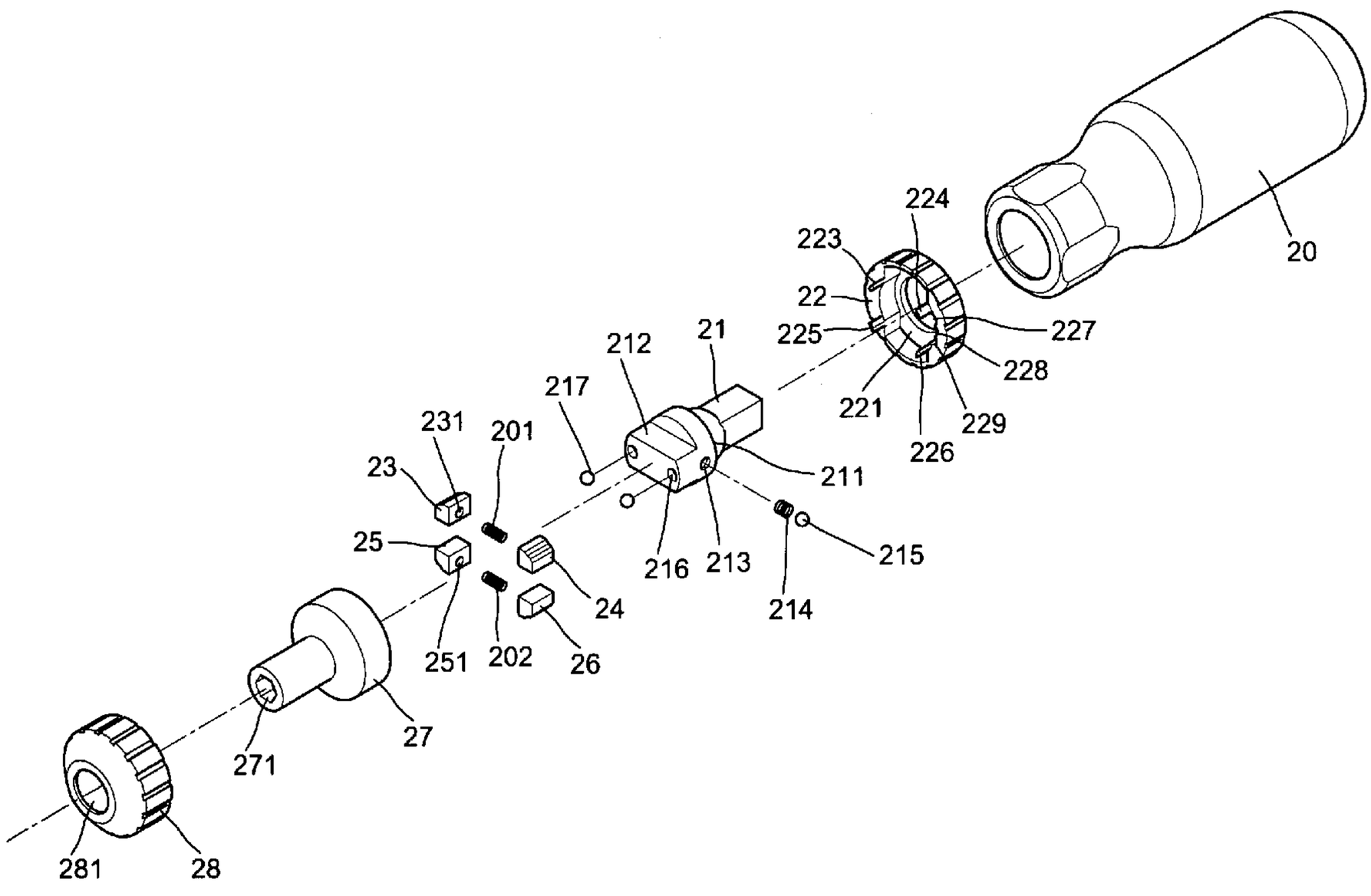
Assistant Examiner—Alvin J. Grant

(57) **ABSTRACT**

An improvement in ratchet coupling means of a driving tool includes a driving member inserted into a handle and covered by a control ring, a ratchet ring and a circular cap, a pair of springs biase the checking blocks in the driving member each having teeth on the sloped surface engaged in the teeth of the ratchet ring and selectively operated by four diagonally arranged stir bars in the control ring which further has three separate positioning grooves respectively engageable within a spring biased steel ball from the driving member for permitting the ratchet driving tool to conduct three fastening modes by its hexagonal socket wrench. A phillips tipped hexagonal shank may be secured to the driving tool by necessary components to change the socket wrench into a screwdriver.

3 Claims, 10 Drawing Sheets



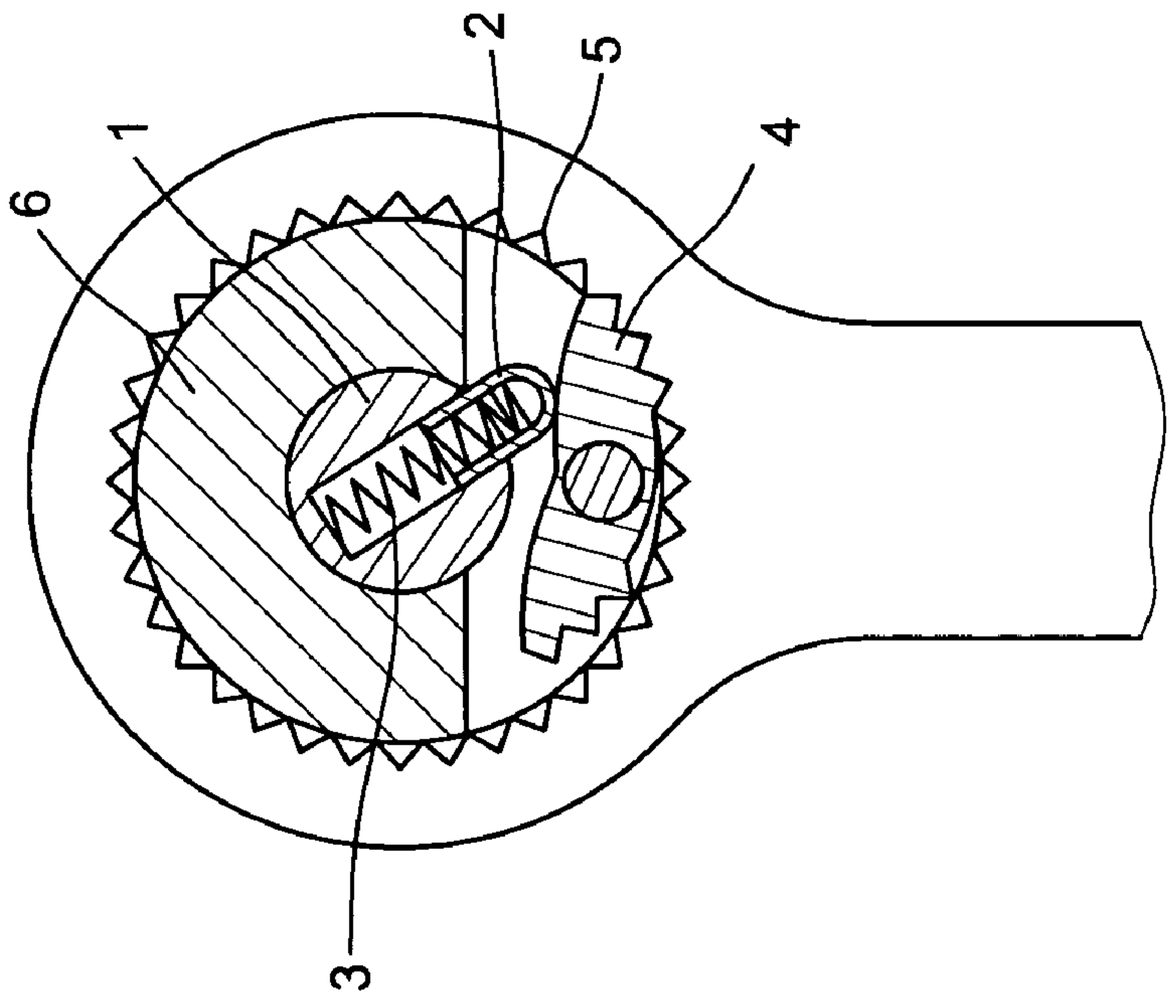


FIG.1
Prior Art

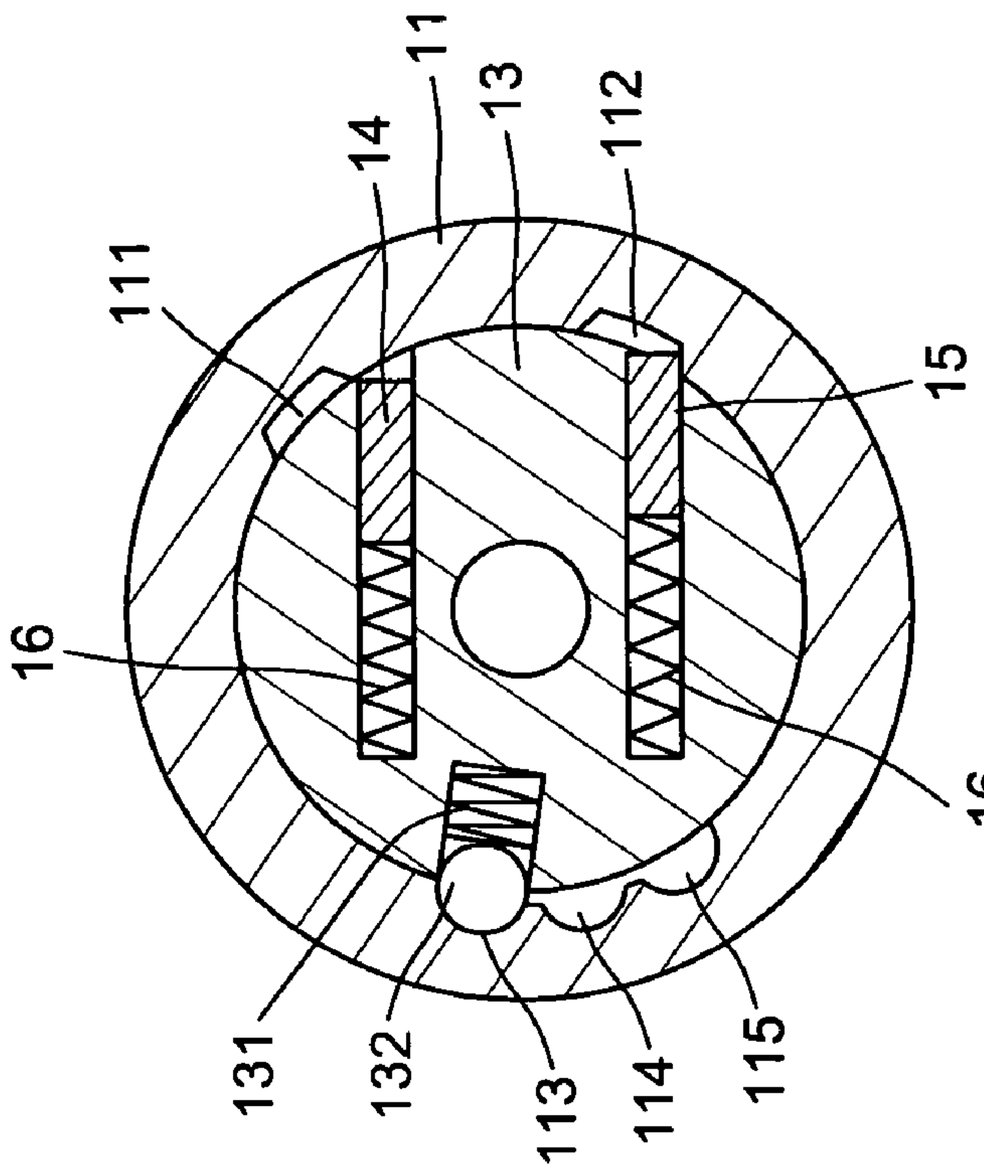


FIG.2
Prior Art

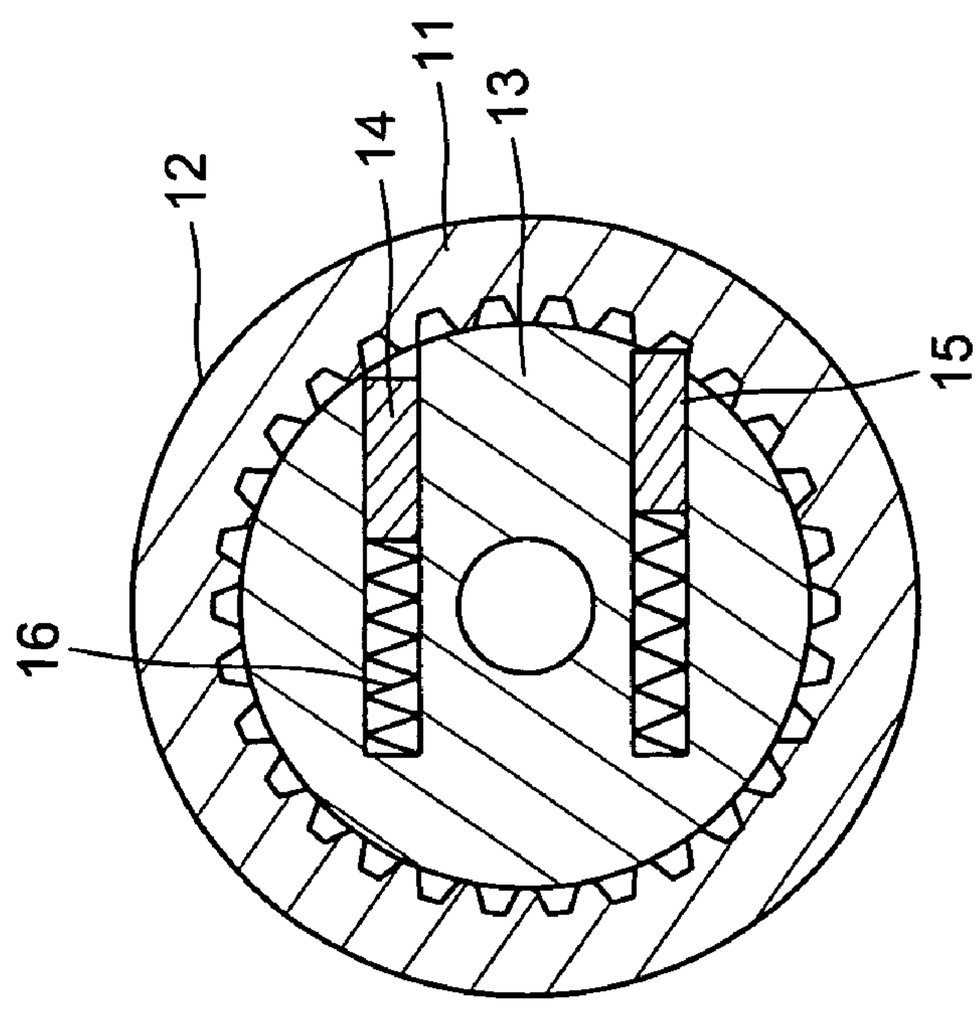
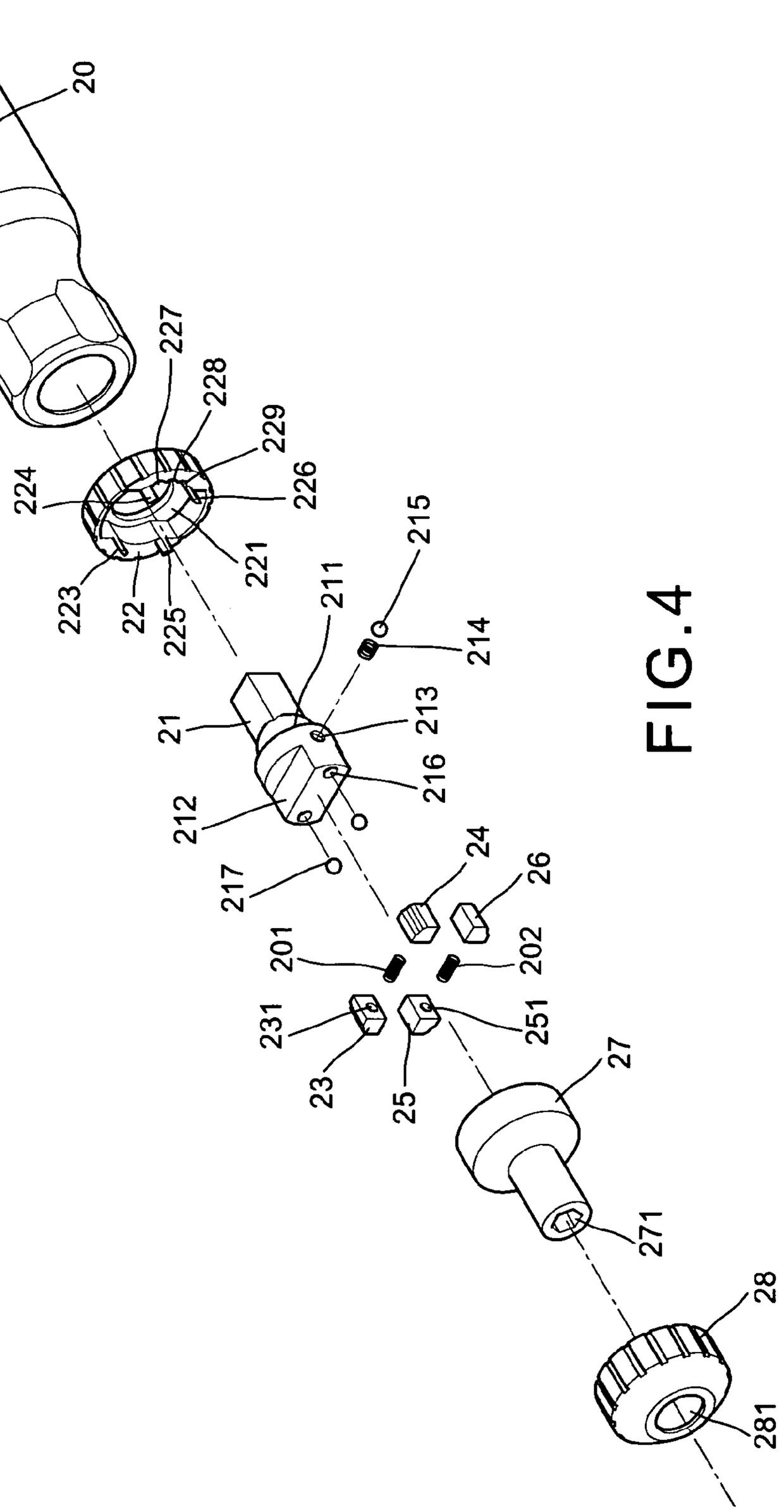


FIG.3
Prior Art


20
227
228
229
224
226
221
223
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225
211
215
214
21
213
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212
217
24
26
201
202
231
23
25
251
27
271
28
281

FIG.4

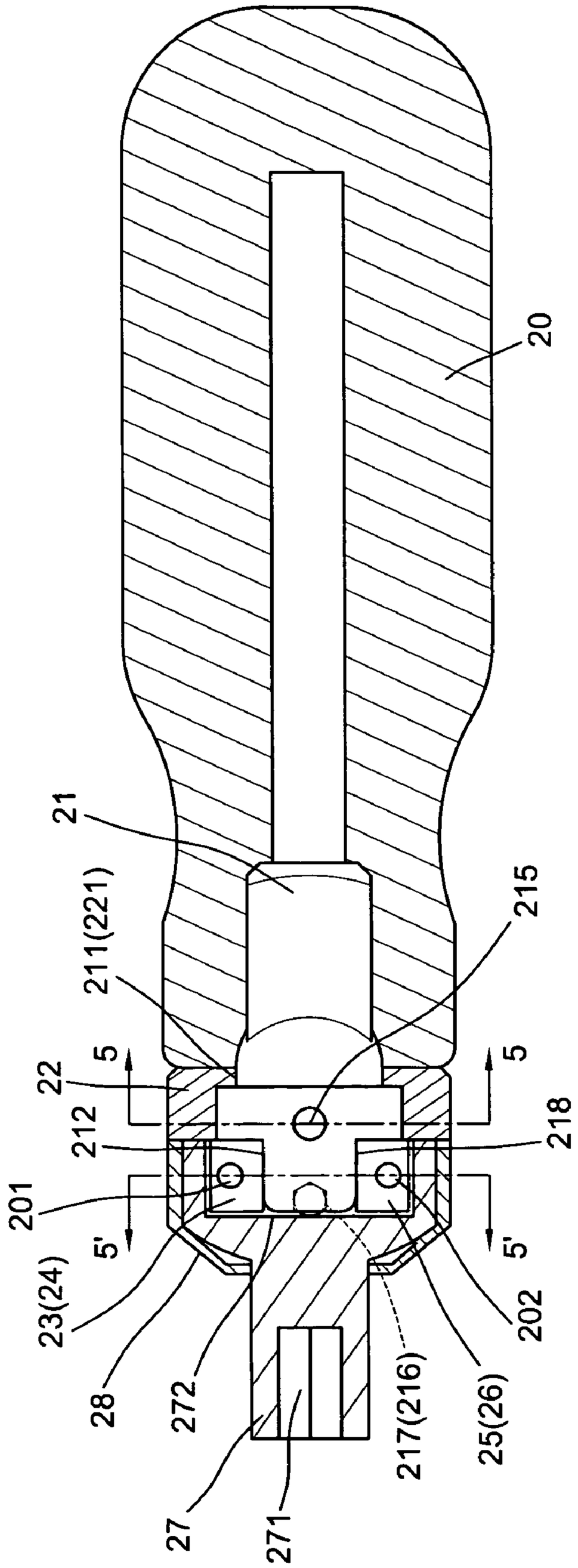

20
21
211(221)
215
22
5
5
212
218
201
5'
5'
23(24)
28
272
27
271
217(216)
25(26)
202

FIG.5

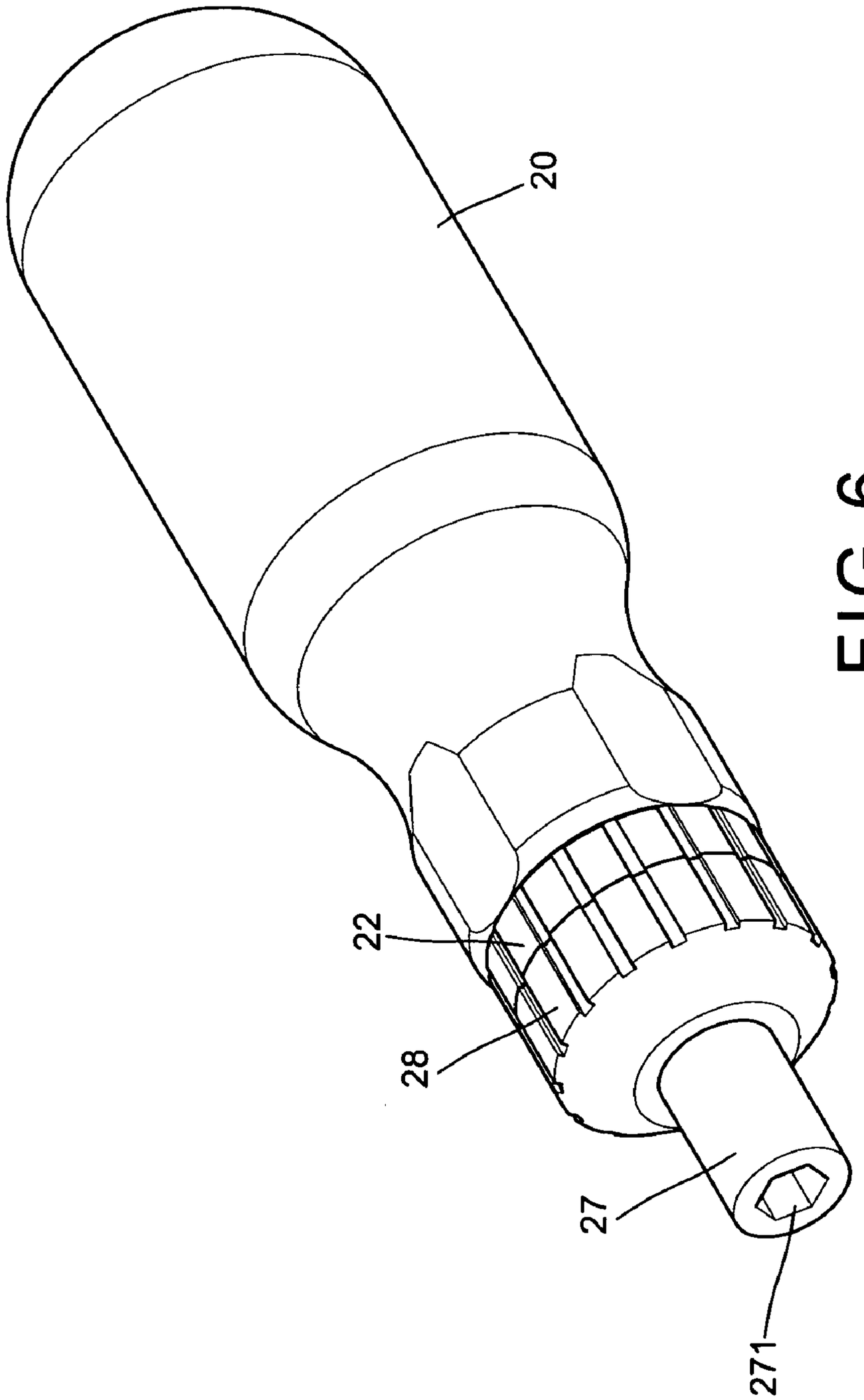


FIG.6

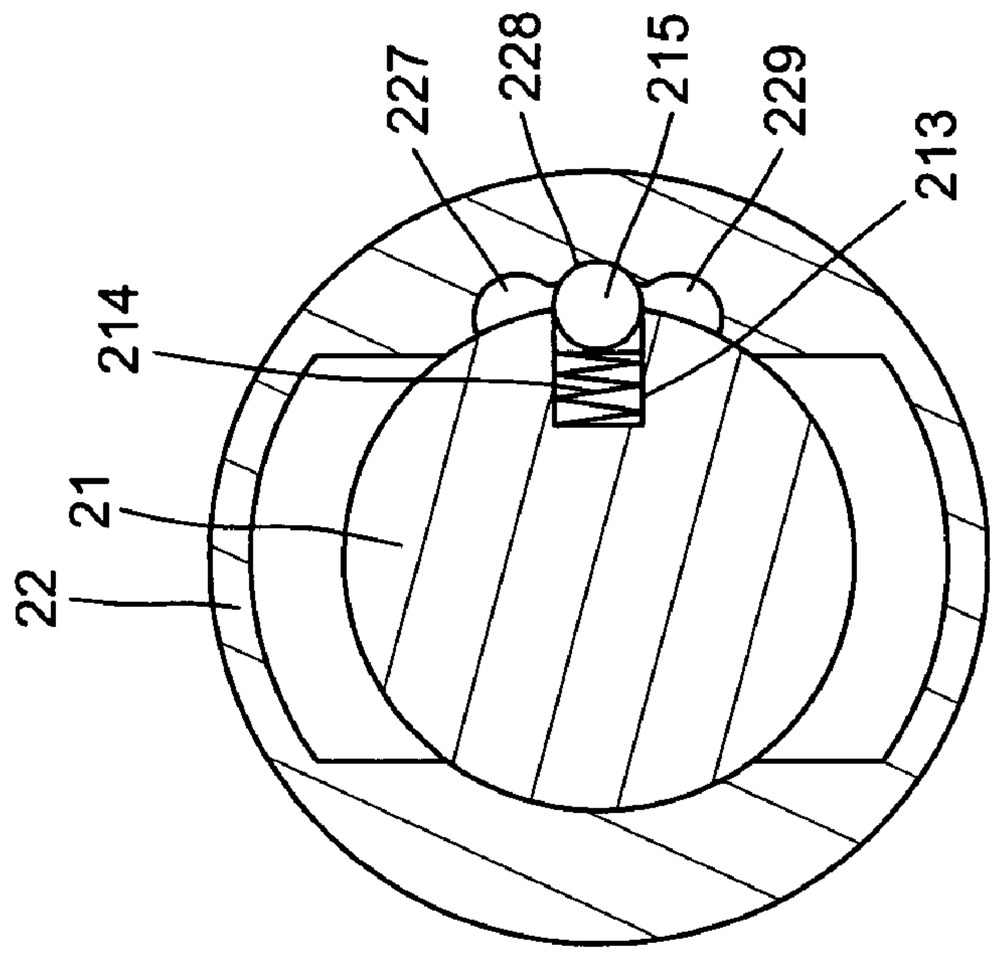

227
228
215
229
213
214
21
22

FIG. 7

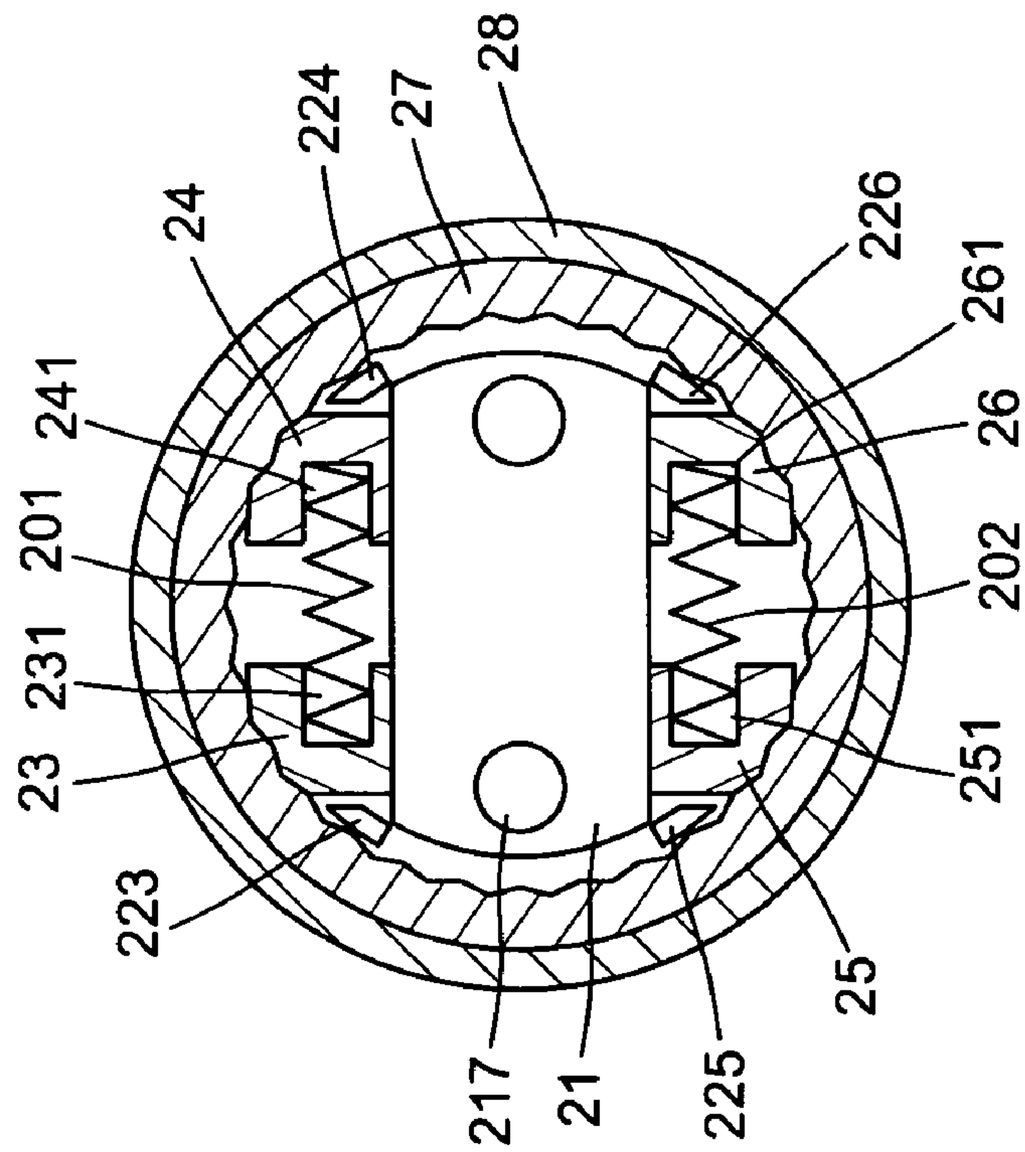

224
27
28
24
226
261
241
26
201
202
231
251
23
223
217
21
225
25

FIG. 8

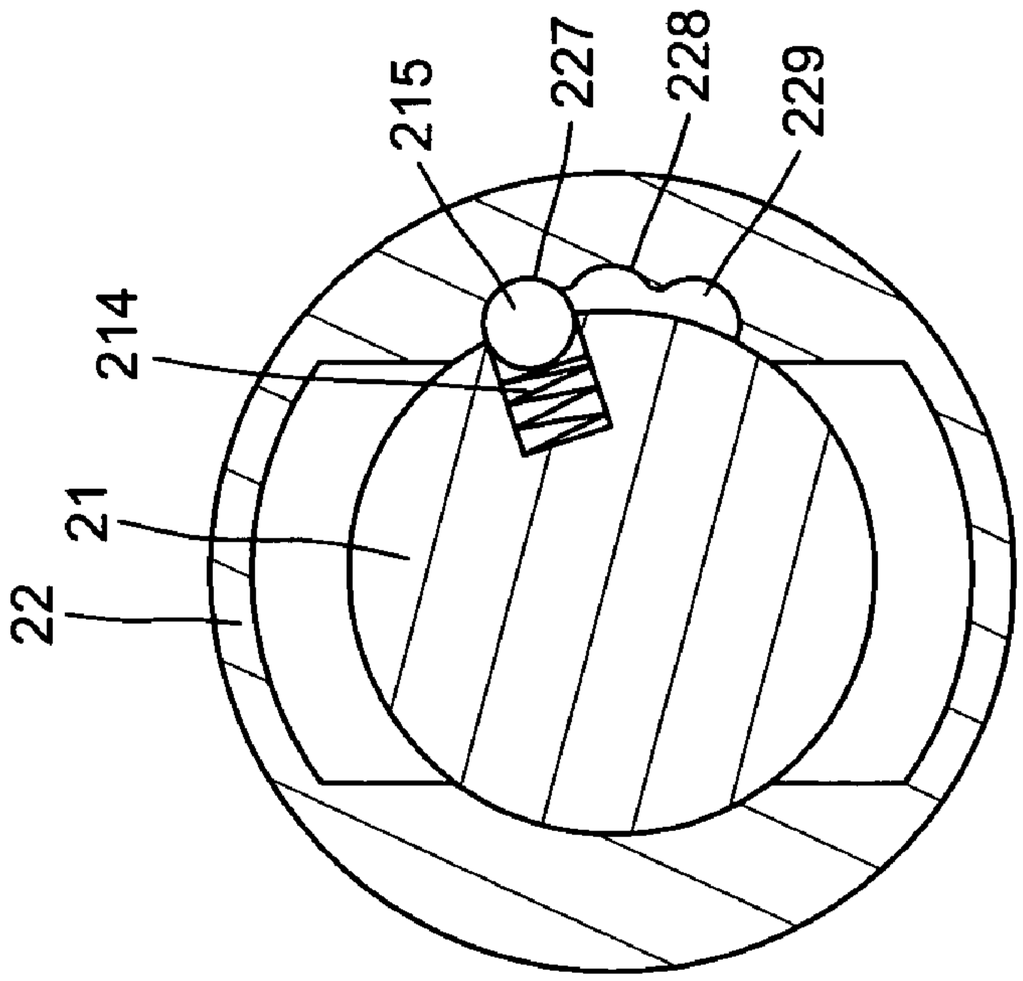
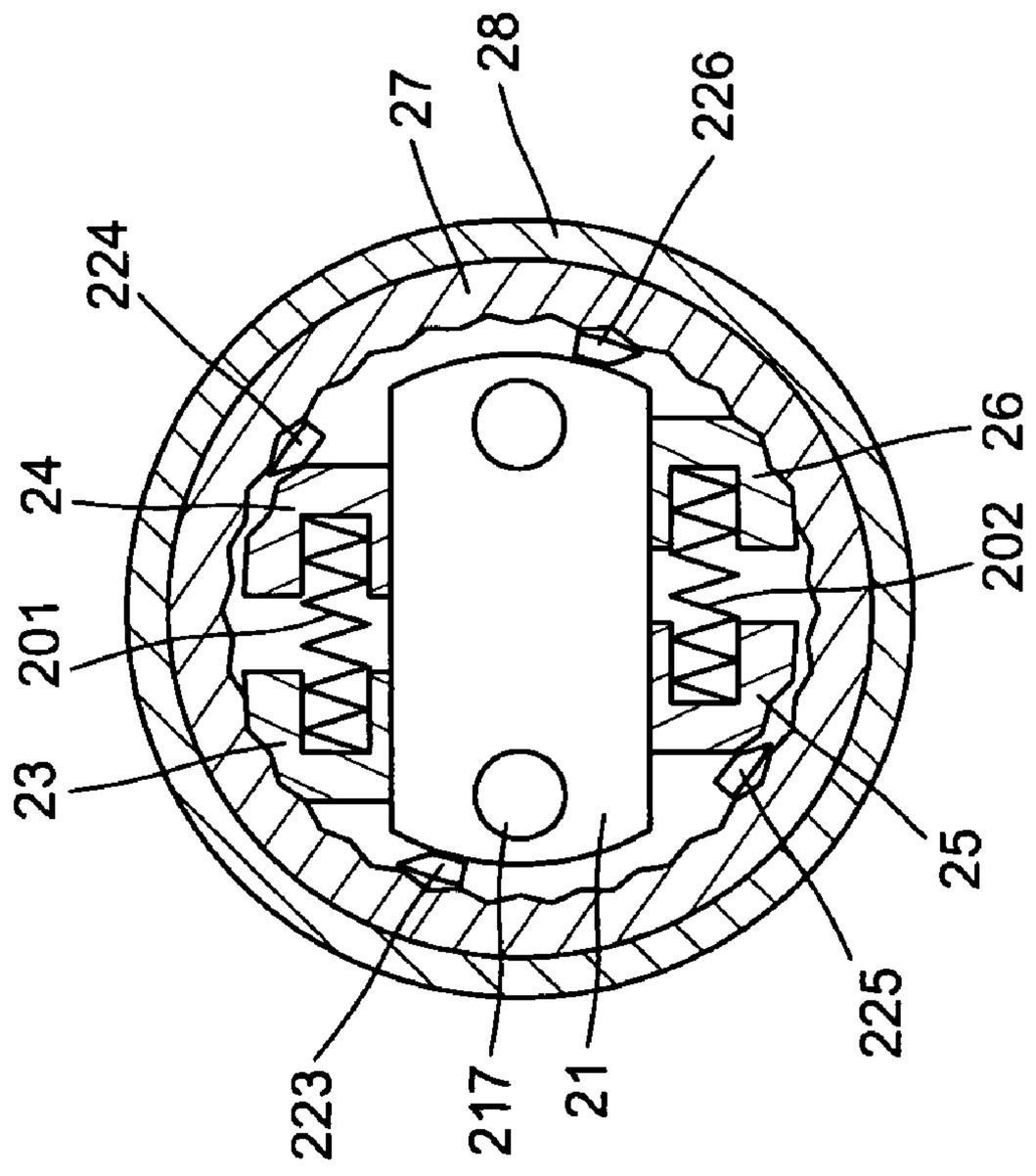

215
227
228
229
214
21
22

FIG.9


27
28
226
224
24
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201
202
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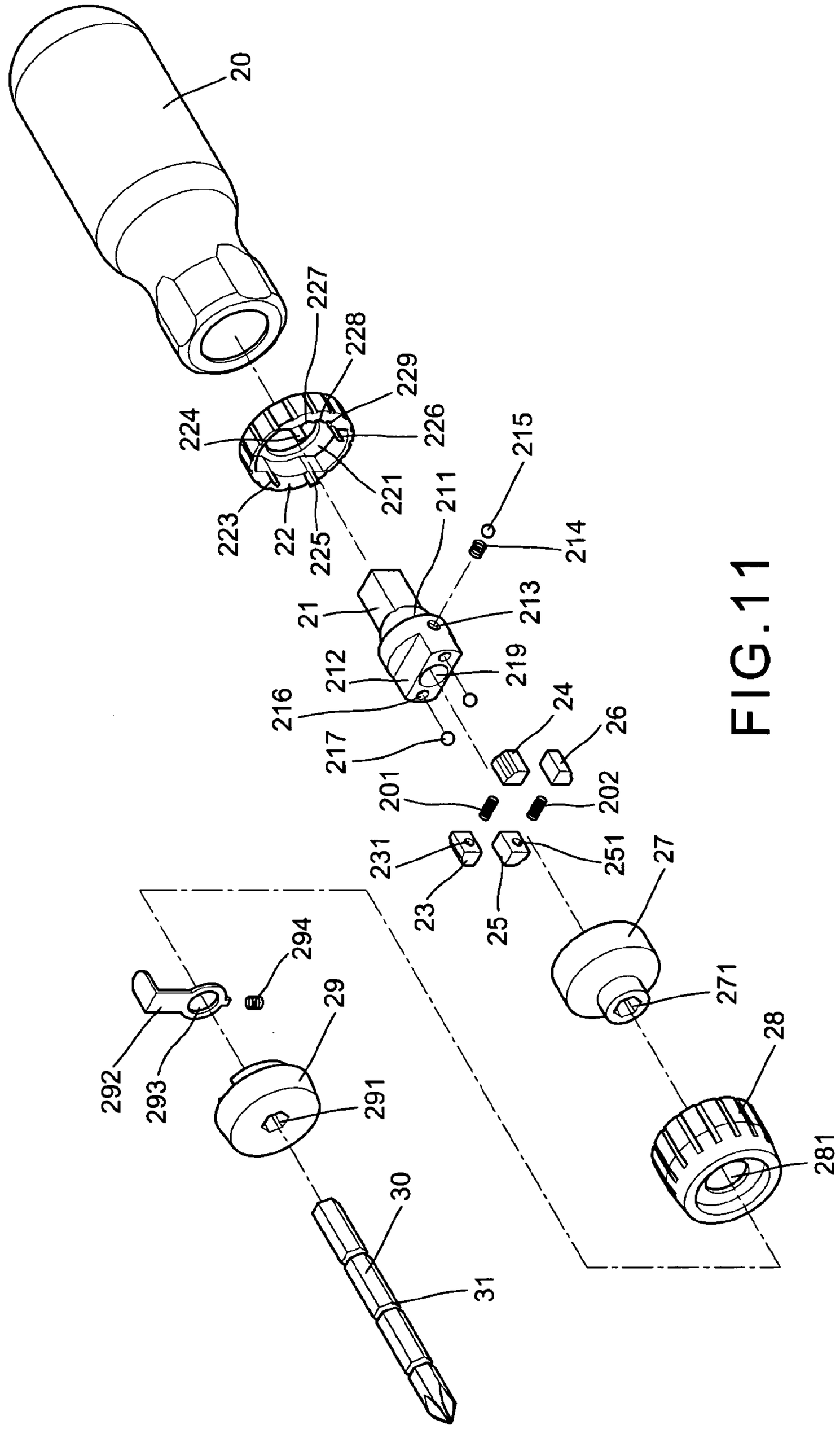
223
217
21
225

FIG.10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294
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281
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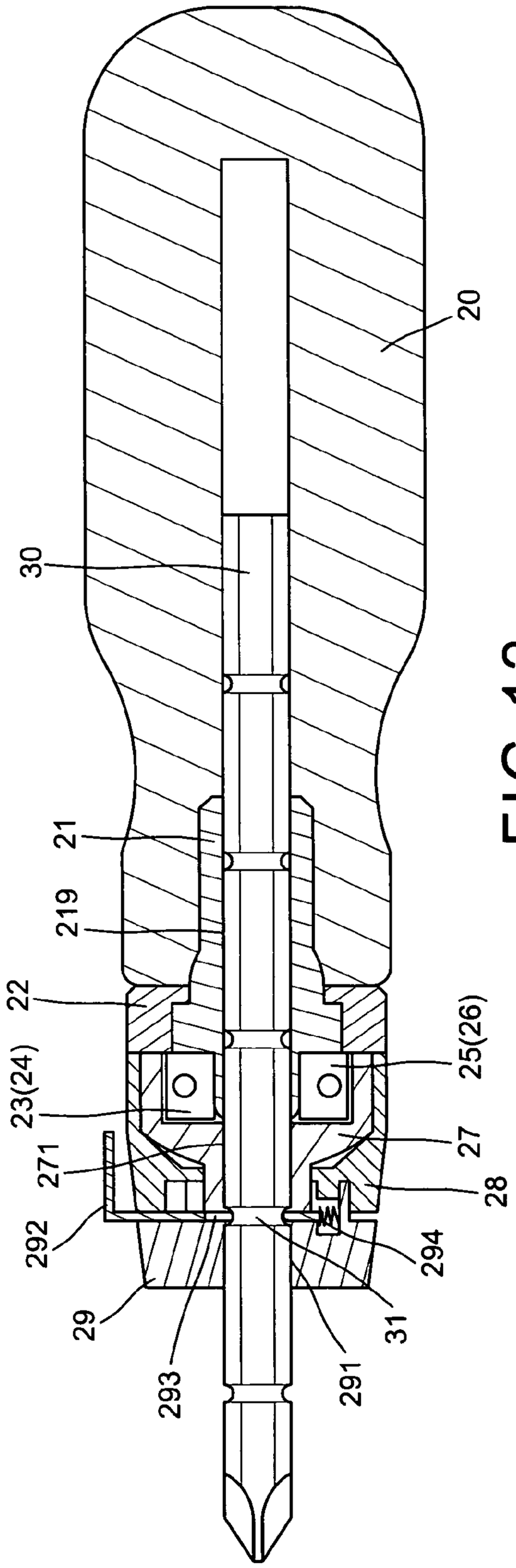
31

FIG.11


20
30
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219
22
23(24)
271
292
29
293
291
31
294
28
27
25(26)

FIG.12

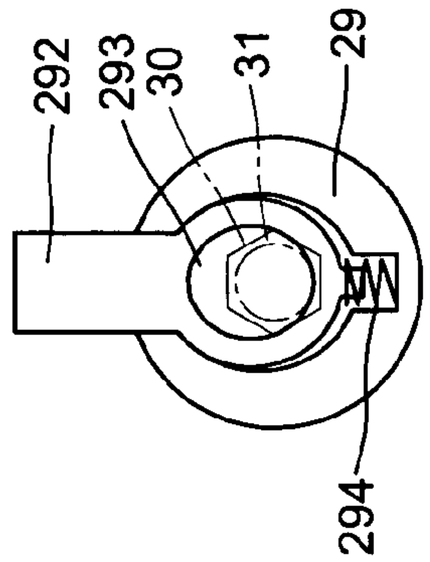
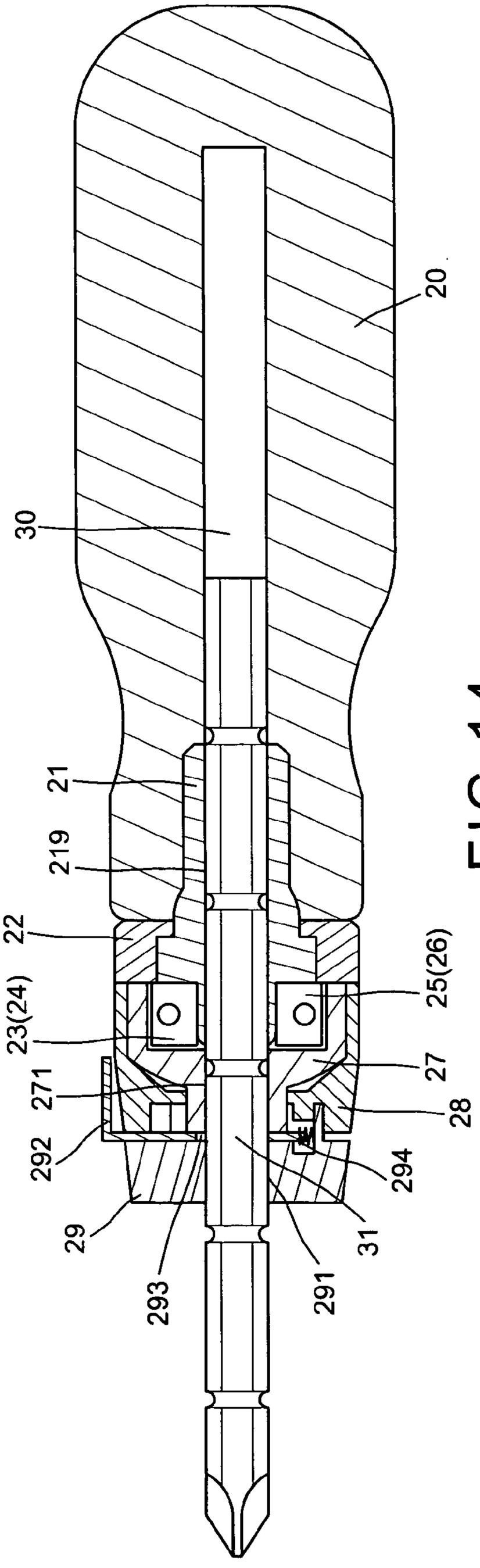

292
293
30
31
29
294

FIG.13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23(24)
25(26)
271
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292
294
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293
291
31

FIG.14

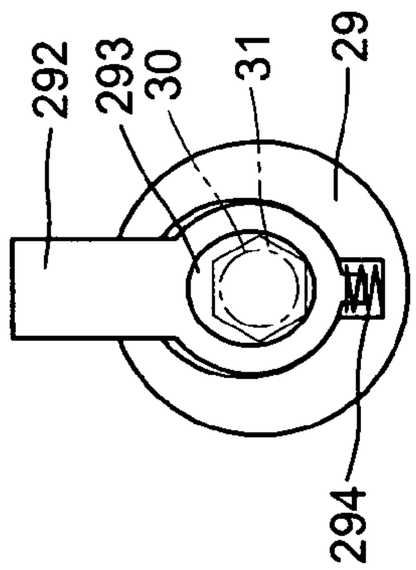
292
293
30
31
29
294

FIG.15

RATCHET COUPLING MEANS FOR A DRIVING TOOL

BACKGROUND OF THE INVENTION

The present invention relates to the ratcheted driving tools and more particularly to an improvement in ratchet coupling means for a driving tool.

As we know that a ratchet checking structured driving tool provides great convenience. This driving tool can fasten or unfasten a bolt or its equivalents by rotating it clockwise, counterclockwise and/or idle running backward. FIG. **1** shows a ratcheted wrench which uses a swivel bottom **1** to control a stir rod **2**. The stir rod **2** is biased by a spring **3** and pushes a ratchet plate **4** becoming oblique on single direction and checking the teeth of the ratchet **5** to enable the driving rod **6** to be rotated on single direction so as to drive a working piece. But the torque of this type of ratchet socket wrench is not so strong and easy to jump off.

FIGS. **2** and **3** show an structurally improved prior art ratchet driving tool which has a control ring **11**, a ratchet ring **12**, a driving rod **13** and a pair of checking rods **14** and **15**. The control ring **11** has a pair of grooves **111** and **112** for receiving one end of the checking rods **14** and **15** which have the U-shaped body and each is biased by a spring **16**. The driving rod **13** has a recess for receiving a spring **131** and a steel ball **132** which can be respectively engaged within three semi-circular grooves **113**, **114** and **115** of the control ring **11** to enable the driving rod **13** to perform three stepped rotation (clockwise, counterclockwise and/or idle running) and is controlled by the stretching or contracting actions of the checking rods **14** or **15** alternately checked the ratchet ring **12**. Due to the springs **16** are positioned at the middle portion of the checking rods **14** and **15** which may cause an unbalance to affect the certainty of the checking action between the checking rods **14** or **15** and the ratchet ring **12**. Besides, each time only enables one of the two checking rods **14** or **15** to check the ratchet ring **12**, the torque is still not strong enough as expected.

SUMMARY OF THE PRESENT INVENTION

The present invention has a main object to provide an improvement in ratchet coupling means for a driving tool in which four checking blocks are added and symmetrically arranged on pair by pair basis so as to intensify torque double in comparison with the prior art.

Another object of the present invention is to provide an improvement in ratchet coupling means for a driving tool in which the four checking blocks can ensure the structural stability and keep the elements thereof not to be biased but exactly checking the ratchet wheel without jumped off.

Further object of the present invention is to provide an improvement in ratchet coupling means for a driving tool in which a stretching and contractible driving shank is added to perform a lengthy adjustment.

Accordingly, the improvement in ratchet coupling means for a driving tool of the present invention comprises generally a driving member connected to the stepped central bore of a handle and enables a control ring disposed on its middle portion and a ratchet ring sleeved on the front end thereof.

The driving member has formed on front opposite sides a pair of flat receiving spaces and an elastic steel ball disposed in a lateral side and a pair of steel balls in front end. The control ring has four protrudent stir bars diagonally arranged in inner periphery in addition to three positioning grooves to receive the steel ball from the lateral side of the driving member.

The four checking blocks are separated into two pairs each of which has a recess facing one another for anchoring

two end of a spring, each pair of the checking blocks are disposed in one of the receiving spaces of the driving member, a cap shaped ratchet ring sleeved to the front end of the driving member having ratchet teeth in inner periphery engaged with the teeth of the checking blocks and a hexagonal socket wrench on front side and a cap on the foremost front of the driving tool engaged with the control ring and having a central bore to permit the socket wrench to pass through and to stretch out of the driving tool. Thereby, to rotate the control ring to disengage a pair of the checking blocks on diagonal positions with ratchet ring and the other checking blocks are still engaged with the ratchet ring so as to enable the driving tool to conduct the three ways rotations to fasten or unfasten a working object. This improvement has achieved an intensification of the torque and the reliable engagement of the components.

The present invention will become more fully understood by reference to the following detailed description thereof when read in conjunction with the attached drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** is a sectional view to show a ratchet socket wrench according to a prior art,

FIG. **2** is a sectional view to show a double checking rods in a driving tool according another prior art,

FIG. **3** is a sectional view to show a double checking rods checking a ratchet according to still another sample of the above prior art,

FIG. **4** is an exploded perspective view to show the preferred embodiment of a ratchet driving tool according to the present invention,

FIG. **5** is a sectional view to show the assembly of FIG. **4**,

FIG. **6** is a perspective view of FIG. **5**,

FIG. **7** is a sectional view taken along line **5**—**5** of FIG. **5**,

FIG. **8** is a sectional view taken along line **5'**—**5'** of FIG. **5**,

FIG. **9** is a sectional view indicating the rotation of the control ring,

FIG. **10** is a sectional view indicating the action of the check blocks,

FIG. **11** is an exploded perspective view to show an additional shank and the related elements engaged to the front end of the preferred embodiment,

FIG. **12** is a sectional view to show the additional shank already engaged with the ratchet driving tool of the present invention,

FIG. **13** is a plane view to show the engagement of the checking cap, the press plate and the shank,

FIG. **14** is a sectional view to show that the press plate is pressed downward, and

FIG. **15** is a plane view to show the disengagement of the press plate with the shank.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to the drawings and initiated from FIGS. **4** to **8**, the improvement in ratchet coupling means for a driving tool of the present invention comprises a handle **20** having a stepped central bore, a driving member **21** having a rectangular rear end fixed into the central bore of the handle **20**, a retaining ring **211** on a middle portion engaged within a circular depression in a control ring **22** which surrounds the driving member **21** without sliding out, a flat rectangular front end to form a pair of receiving spaces **212** and **218** on the top and the underside thereof each receives a pair of checking blocks **23**, **24**, **25** and **26**.

The checking blocks **23**, **24**, **25** and **26** each has a circular recess **231**, **241**, **251** and **261** in inner side facing each other, wherein the blocks **23** and **24** are biased by a spring **201** and the blocks **25** and **26** are biased by a spring **202** therebetween, a circular recess **213** in a left side of the driving member **21** engaged with a spring **214** and a steel ball **215** and a pair circular recess **216** spacedly formed in the flat rectangular front end respectively engaged with a pair of steel balls **217**. The control ring **22** further has a plurality of stir bars **223**, **224**, **225** and **226** spacedly and diagonally formed on inner periphery for respectively stirring the checking blocks **23**, **24**, **25** and **26** each of which has teeth on sloped surface engageable with the teeth of the ratchet ring **27**. In the inner periphery of the control ring **22** further has three positioning grooves **227**, **228** and **229** formed spaced apart for selectively positioning the steel ball **215** of the driving member **21**. The cap shaped ratchet ring **27** sleeved onto the driving member **21** having teeth on inner periphery enabling to stop against the checking blocks **23**, **24**, **25** and **26** and a hexagonal socket wrench **271** centrally projected foreward from the front surface thereof, and a circular cap **28** covering the ratchet ring **27** and connected with the control ring **22** by means of high frequency welding and having a central bore **281** for permitting the hexagonal socket wrench passing through and stretching out of the cap **28**.

In operation, engage the socket wrench onto a working object and rotate the control ring **22** for a distance (as shown in FIG. **9**). When the steel ball **215** engaged with the positioning groove **227**, the pair of stir bars **224** and **225** which are diagonally positioned in the control ring **22** stir the checking blocks **24** and **25** disengaging their teeth with the teeth of the ratchet ring **27**, but the teeth of the checking blocks **23** and **26** still remain engaged with the teeth of the ratchet ring **27** (as shown in FIG. **10**). Meanwhile the ratchet driving tool can be able to rotate clockwise to fasten the working piece and to be idle running counterclockwise. On the contrary, if the steel ball **215** is positioned within the positioning groove **229**, the ratchet driving tool may rotate counterclockwise to unfasten a working piece and to be idle running clockwise. Further, if the steel ball is in the positioning groove **228** (as shown in FIGS. **7** and **8**) all the stir bars **223**, **224**, **225** and **226** are in stationary and the teeth of the checking blocks **23**, **24**, **25** and **26** are all engaged with the teeth of the ratchet ring **27**. So that the socket wrench is in a fixed status.

Referring to FIGS. **11** to **13**, additional elements such as a hexagonal shank **30**, a checking cap **29** and a L-shaped press plate **292** may be engaged with the ratchet driving tool. However, a central bore **219** has to be formed in the driving member **21** and the ratchet ring also adds a through hole so as to permit the rear end of the hexagonal shank **30** to enter into the central bore of the handle **20**. The hexagonal shank **30** has a plurality of annular grooves **31** spacedly formed in the body and a phillips tip at free end. The checking cap **29** has a hexagonal central bore **291** and an arcuate extension on the back side.

The L-shaped press plate **292** has a retaining ring **293** at lower end. When assembling, sleeve the checking cap **29** and the L-shaped press plate **292** sequentially on the shank **30**, then insert the shank **30** into the handle **20** through the cap **28**, the ratchet ring **27**, the driving member **21** and the control ring **22** and then engage the extension of the checking cap **29** into a depressed front end of the cap **28** and engage the retaining ring **293** of the L-shaped press plate **292** into one of the annular grooves **31** and the retaining ring **293** is biased by a spring **294** which has a lower end stopped against the arcuate extension of the checking cap **29**. When

press the L-shaped press plate **292** downward, the retaining ring **293** is automatically disengaged with the annular groove **31** so as to allow the shank **30** to move slidably and/or to remove from the driving tool. The addition of the shank **30** does not affect the three stepped rotation functions of the driving tool.

Note that the specification relating to the above embodiment should be construed as an exemplary rather than as a limitative of the present invention, with many variations and modifications being readily attainable by a person of average skill in the art without departing from the spirit or scope thereof as defined by the appended claims and their legal equivalents.

I claim:

1. An improvement in ratchet coupling means for a driving tool comprising:

a handle having a stepped central bore;

a driving member having a retaining ring at middle portion engaged with a circular depression in a control ring, a rectangular rear end inserted into the stepped central bore of said handle, a flat rectangular front end defined a pair of receiving spaces on top and underside for respectively receiving two pairs of checking blocks each of which has a first circular recess facing each other for respectively anchoring two ends of a pair of first springs and teeth on a sloped surface, a second circular recess in a lateral side for anchoring a second spring and a first steel ball and a pair of third recesses formed spaced apart in fore side of the flat rectangular front end for anchoring a pair of second steel balls respectively, said control ring having four stir bars diagonally positioned on inner periphery in addition to three separate positioning grooves formed therebetween;

a cap shaped ratchet ring sleeved onto said driving member having teeth on an inner periphery engageable with the teeth of said checking blocks and a hexagon socket wrench centrally projected foreward from a front surface;

a circular cap covering said ratchet ring, said driving member and eventually engaged with said control ring and connected by means of high frequency welding and having a central bore to permit said hexagon socket wrench passing through and projecting from said ratchet driving tool;

thereby, rotating said control ring a distance to allow said ratchet driving tool to conduct a three-way fastening and unfastening a working object.

2. The improvement as recited in claim **1**, wherein said driving member further has a central bore and said ratchet ring further has a through hole communicating with said hexagon socket wrench.

3. The improvement as recited in claim **1**, further has a diagonal shank which has a plurality of annular grooves formed in outer periphery and a phillips tip, may be inserted into said handle through said circular cap, said ratchet ring, said driving member and said control ring and secured by a L-shaped press plate which has a retaining ring engaged into one of said annular grooves and biased by a spring on lower end and stopped against an arcuate extension on rear side of a checking cap which is engaged with a depressed front end of said circular cap.

* * * * *